

REMARKS

Amendments to the Claims

The independent claims have been amended to recite the elastomer is nonhalogenated, and the viscosity average molecular weight of the elastomer. Support for the first amendment is in page 7, lines 26-29 of the original specification. Support for the second amendment is in page 8, lines 11-12 of the original specification.

35 U.S.C. § 112, first paragraph

The claims have been rejected under 35 U.S.C. § 112, first paragraph, as failed to be supported by the original specification. Specifically, the phrases “styrenic derived units in amount of 1 to 15 wt%” and “some of the styrenic derived units are functionalized” were held to be unsupported by the specification.

The original specification includes the originally filed claims. Original claims 6 (previously cancelled) and 32 (now cancelled) both recite that the styrene derived units are present from 1 to 15 wt% of the elastomer. Thus, the first rejected phrase is supported by the original specification.

Furthermore, in the paragraph referenced in the Final Office Action (the paragraph bridging pages 6 and 7), Applicants disclose embodiments of a “copolymer” of the styrenic derived units and an olefin. The olefin is disclosed as being present in the amount of 70 to 99.5 wt% in one embodiment, and 85 to 99.5 wt % in another embodiment. If the elastomer is a copolymer of only the olefin and the styrene, and the olefin can be as much as 99.5, one skilled in the art would readily appreciate that at the time of the invention, while only recited in the claims, Applicants had possession of the invention of a copolymer of olefins and styrenic derived units wherein the styrenic could be as low as 1.0 wt% (and in fact, had possession of a styrenic content as low as 0.5 wt% as the two monomers should comprise 100 wt% of the elastomer). To resolve the possible issue, the content of original claims 6 and 32 has been added to the specification.

Regarding the second rejected clause, the claims have been amended to recite the elastomer comprises substituted styrenic derived units. The language in

amended claims 1 and 22 corresponds to original claims 2 and 30, and thus are fully supported by the original specification.

35 U.S.C. § 112, second paragraph

Claims 1, 10, 22 and 32 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite.

Claim 22 has been amended to provide proper antecedent basis.

Clarity is asked for in regards to claims 10 and 32 in light of claims 1 and 22. The amendments to claims 1 and 22 to address the 112 first paragraph rejection eliminates the noted indefiniteness. Claims 1 and 22 recite that the elastomer comprises substituted styrenic derived units, no longer reciting that some of styrenic units are “functionalized.” This amendment is not intended to limit the claims to non-functionalized styrene. As disclosed in the specification, the elastomer is functionalized along the backbone, and any monomer units of the elastomer, including the styrenic derived units, may be functionalized. Thus, even where claims 1 and 22 not amended, the different claims need not have been indefinite, as the amounts recited in claims 1 and 22 are directed to the total amount of styrenic units present.

Objection to the Claims

Claims 2 and 30 are objected to as failing to further limit. This objection is now moot, though for the record, in the context of the present invention, a styrenic unit can be substituted without being functionalized and a styrenic can have a substitution without being functionalized – the two words/actions are not equivalent.

Obviousness-type Double Patenting

All pending claims have been rejected under the doctrine of obviousness-type double patenting over claims 1-45 of copending Application No. 11/293561.

As noted in the rejection, co-pending Application 11/293561 is directed to a nanocomposite comprising halogenated rubber. The presently recited invention

is specifically directed to a non-halogenated rubber (support therefore found in the examples and pg 7, lines 26-29).

Applicants respectfully assert that the inventions are directed to separate and distinct inventions and ask that this rejection be reconsidered and withdrawn.

35 U.S.C. § 103

Claims 1, 2, 5, 8, 10, 13, 16, 19, and 20 have been rejected under 35 U.S.C. § 103 as being obvious over Usuki (EP 1029823) in view of Chino (US 6372855). This rejection is respectfully traversed for the following reasons.

The goal of Usuki, as recognized in the rejection, is to render a layered clay more organophilic and increase the distance between the clay layers to enable the clay to be more readily incorporated into clay reinforced compositions. Usuki teaches very specific steps to obtain the organophilic clay composite and the final clay reinforced compositions. First, the clay must be treated with an onium ion of a particular size, while separately a “guest molecule” is provided with a polar group to render the guest molecule organophobic. After the clay and the guest molecule have both been modified, a very small amount of the organophobic guest molecule, 0.5 to 1 wt% of the clay [0035], is combined with the clay to create what may be referenced as a clay masterbatch. This organophilic clay masterbatch is then blended with other compounds to create a clay reinforced composition.

In regards to the guest molecule to be polarized, if it is the “main” guest molecule, it should have a length equal or larger than the onium ion on the clay layers [0031], with a molecular weight of from about 100 to about 100,000 [0036]. If the polarized guest molecule is the “first” guest molecule, it has a length equal or small than the onium ion so that, due to its small molecular length, it may more easily “enter the interlayer section compared with the main guest molecule” [0060], avoiding “the difficult process for incorporating the polar group to the substance having a larger molecular length” [0064]. Thus, the polarized first guest molecule does not have a molecular weight greater than 100,000.

In essence, Usuki teaches selecting a polarized compound of a defined size. Most preferably actually appears to be the ‘first’ quest molecule since it

more easily intercalates with the clay layers, but using the smaller first guest molecule then requires the use of the second non-polarized guest molecule. Thus, the teachings of the 'main' guest molecule reduces the complexity of preparing the organophilic clay composite. However, so that the main guest molecule has a size that readily permits entry into the clay layers, the main guest molecule is limited in size.

In disclosing specific examples of main guest molecules, Usuki discloses compounds that have carbon counts of 12 and 18. Usuki teaches the main guest molecule may be polyethylene, polypropylene, polyisoprene, or polybutadiene, but even in selecting these compounds, the polarized compound must have a molecular weight of not more than 100,000; thus teaching a relatively small, and most likely a liquid, compound.

Applicants invention is directed to a nanocomposite comprising an elastomer having a viscosity average molecular weight range in the range of 200,000 to 2 million. As known by those skilled in the art, the relationship between molecular weight MW and viscosity average molecular weight Mv for typical polymers is that Mv is less than MW. Thus for the recited elastomer, the molecular weight is a minimum of greater than 200,000 – thus the elastomer has a size more than twice that desired by Usuki, and actually taught away from by Usuki. As taught by Usuki, attempting to insert a larger molecule into the clay layers is not desired and would be a “difficult process”.

Chino is directed to modifying a highly saturated elastomer of limited double bonds to obtain an improved affinity for carbon black or silica. Chino teaches grafting onto the polymer to improve the affinity of the elastomer with carbon black or silica. Presumably the logic used in the rejection for looking to Chino is that affinity to carbon black or silica would be similar to a desired affinity to an exfoliated clay. As noted in the rejection, Chino discloses the functionalization of Exxon's Expro 90-10 – a brominated copolymer that has a viscosity average molecular weight greater than 100,000 (Applicants direct the Examiner's attention to Table IV of US Patent 5,162,445, cited at pg 7 of Applicants application, which discloses some of Exxon's work on brominated para-methylstyrene isobutylene copolymers and formed the basis of the

commercial Exxpro. The commercial grade of Exxpro 90-10 has GPC measured molecular weights in the range of about 450,000 to about 525,000).

In the rejection, it is held that it would have been obvious to one skilled in the art to utilize the intercalating rubber of Chino in the composition of Usuki since both are rubber compositions and Chino discloses a similar polar group to those desired by Usuki on his taught guest molecules.

Applicants respectfully disagree.

To establish *prima facie* obviousness, there 1) must be some suggestion or motivation in the art to modify or combine the references; 2) must be a reasonable expectation of success and 3) the combined references must teach or suggest all the claim limitations. Graham v. Deere

As discussed above, Usuki teaches those skilled in the art that the polarized guest molecule should have a relatively small size in order to readily insert itself into the clay layers and between the onium ions that initially intercalated the clay layers. The polarized compounds of Chino are significantly larger than those desired by Usuki, and per the teachings of Usuki, not only would one skilled in the art not have been motivated to combine the teachings of Chino with Usuki, one would not have a reasonable expectation of success as Usuki teaches that the larger compounds do not achieve the desired results.

Furthermore, the combined references fail to teach the claim limitations of a non-halogenated elastomer having the recited molecular weight properties. A possible argument could be attempted by the Office that one skilled in the art reading Chino would find that copolymers of a molecular weight of greater than 100,000 are interchangeable with those having a molecular weight less than 100,000 since Chino teaches functionalizing both low molecular weight compounds (see Examples I-1 and I-2) and high molecular weight compounds (Example I-3 cited in the example) and thus one skilled in the art would have found it obvious to expand the molecular weight range of the polarized guest molecules of Usuki. However, Usuki gives specific reasons for the limited molecular weight range of the polarized guest molecular weight and these negative teachings can not be ignored. See MPEP 2141.02; ‘We have noted elsewhere, as a “useful general rule,” that references that teach away cannot serve

to create a *prima facie* case of obviousness.’ *In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q. 1131, 1132 (Fed. Cir. 1994).

Thus, the present rejection fails to establish *prima facie* obviousness. It is requested that this rejection be reconsidered and withdrawn.

Claims 72 - 76 have been rejected under 35 U.S.C. § 103 as being obvious over Usuki (EP 1029823) in view of Chino (US 6372855) and further in view of Adjabani. This rejection is respectfully traversed for the following reasons.

The above discussion of Usuki and Chino is relevant and is incorporated herein by reference.

Adjabani is relied upon for teachings of specific polar groups.

However, Adjabani fails to remedy the deficiencies of Usuki in view of Chino. Even if one skilled in the art were motivated to use the polar groups of Adjabani with the p-methylstyrene-isobutylene compounds of Chino, Usuki teaches that such large elastomers are contrary to the intended goals of his teachings. This rejection fails for the same reasons as set forth above: no motivation to combine and no reasonable expectation of success.

Thus, this rejection fails to establish *prima facie* obviousness.

Claims 22, 23, 27, 29, 30, 32, 34-37, 39, 42, 45, 72-76 are rejected under 35 U.S.C. § 103 as being obvious over Usuki (EP 1029823) in view of Chino (US 6372855) as applied above and further in view of Nanni (US 2004/0102557). This rejection is respectfully traversed for the following reasons.

The above discussion of Usuki and Chino is relevant and is incorporated herein by reference.

Nanni is relied upon for its teachings of radical reactions using peroxides. The potentially relevant teachings are found in [0048]. Nanni also teaches the base polymer has a molecular weight of between 2,000 and 1,000,000 [0041].

Combining the reasoning for the rejection, it is held that it would have been obvious to one skilled in the art to utilize the intercalating rubber of Chino in the composition of Usuki since both are rubber compositions and Chino discloses a similar polar group to those desired by Usuki on his taught guest molecules and

then it would have been obvious to use a peroxide radical to achieve the elastomer functionalization as taught by Nanni.

Applicants respectfully disagree.

To establish *prima facie* obviousness, there 1) must be some suggestion or motivation in the art to modify or combine the references; 2) must be a reasonable expectation of success and 3) the combined references must teach or suggest all the claim limitations. Graham v. Deere

As discussed above, Usuki teaches those skilled in the art that the polarized guest molecule should have a relatively small size in order to readily insert itself into the clay layers and between the onium ions that initially intercalated the clay layers. The polarized compounds of both Chino and Nanni are significantly larger than those desired by Usuki, and per the teachings of Usuki, not only would one skilled in the art not have been motivated to combine the teachings of Chino and Nanni with Usuki, one would not have a reasonable expectation of success as Usuki teaches that the larger compounds do not achieve the desired results.

Furthermore, the combined references fail to teach the claim limitations of a non-halogenated elastomer having the recited molecular weight properties. Similar to the argument above, the Office might argue that one skilled in the art reading Nanni would find that copolymers of a molecular weight of greater than 100,000 are interchangeable with those having a molecular weight less than 100,000 as taught by Usuki, and thus one skilled in the art would have expanded the molecular weight range of the polarized guest molecule. However, Usuki gives specific reasons for the limited molecular weight range of the polarized guest molecular weight and thus negative teachings can not be ignored.

Thus, the teachings of Nanni fail to remedy the deficiencies of Usuki in view of Chino and this rejection fails for the same reasons as set forth above: no motivation to combine and no reasonable expectation of success.

Thus, this rejection fails to establish *prima facie* obviousness. It is requested that this rejection be reconsidered and withdrawn.

In light of this amendment, all of the claims now pending in the subject patent application are allowable. Thus, the Examiner is respectfully requested to allow all pending claims.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated, since this should expedite the prosecution of the application for all concerned.

Respectfully submitted,

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